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Investigating the Relationship between Business Analysts' Competency and IS Requirements Elicitation: A Thematic-analysis Approach

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Abstract:

Researchers and practitioners have consistently reported poor requirements elicitation (RE) as one of the major reasons for information system (IS) project failures. In the last two decades, RE research and practice have focused predominantly on developing tools and techniques for business analysts (BAs) to use and improve RE; however, they have paid little attention to the importance of the competency of the BAs involved in RE. We investigate the relationship between the BAs' competency and RE through an exploratory study. We applied a thematic network analysis approach, along with a four-stage qualitative data-analysis process, to discover four business view and six system view themes and their relationships to BAs' competency. Our results indicate that senior, intermediate, and junior BAs performed similarly in selecting stakeholders' viewpoints and collecting requirements from them; however, senior BAs focused more on high-level requirements than the low-level technical requirements of the system. The results suggest that BAs' competency play a significant role in RE and that organizations that clearly define BAs' competency can help them to identify the right BA for the right job.

Keywords: Business Analyst Competency, Thematic Analysis, Business View, System View Requirements Elicitation, Information System Development.

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1 Introduction

Whether IS projects succeed depends highly on effective requirements elicitation (RE) from the system's key stakeholders (Appan & Browne, 2012; Damian, 2007; Davis, 1982). RE's effectiveness largely depends on the competency of the BAs involved in the RE activity (Brûlé, 2005; Damian, 2007; Glinz & Wieringa, 2007; Vongsavanh & Campbell, 2008). In this paper, we use thematic-analysis techniques to identify the association between the competency of the BAs and the themes of the IS requirements that we identified during an exploratory study.

Despite recent advancements in IS project-development methodologies, the industry continues to experience a high IS project failure rate (nearly 70%), which costs it billions of dollars each year (Cerpa & Verner, 2009; Marx, 2008; Schwalbe, 2013). Such a high failure rate is often attributed to poor RE. In the last two decades, RE researchers and practitioners have mainly focused on improving RE from various perspectives, such as the business value perspective (Aurum & Wohlin, 2007; Samavi, Yu, & Topaloglou, 2009), the organizational perspective (Daneva & Wieringa, 2006; Yu, 1993), the system perspective (Castro, Kolp, & Mylopoulos, 2002; Singh & Woo, 2009), the strategic perspective (Bleistein, Cox, Verner, & Phalp, 2006; Lei & Slocum, 2005), the technical perspective (Jackson & Zave, 1995; Letier & Lamsweerde, 2002), and the capability perspective (Baiyere & Salmela, 2014; Danesh & Yu, 2014). However, they have paid little attention to the competency that BAs need to effectively perform RE.

RE has become a specialist field because of the ever-growing organizational business environments and the high-quality support they demand from their information systems. As professionals, BAs now use specialist analytical tools, techniques, and procedures to effectively collect and analyze business requirements (Brûlé, 2005; Paul & Tang, 2015; Vongsavanh & Campbell, 2008). Specialization tends to be around particular types of business analysis. In this situation, identifying an appropriate BA for a particular type of RE task has become essential. While BAs' functions vary depending on the industry and the size and structure of the organization, they need certain core competency to effectively understand stakeholders' business needs and determine viable solutions (Damian, 2007; Snow & Hrebiniak, 1980).

Researchers and practitioners have stressed the need to define the competency that BAs need to engage in RE (Brûlé, 2005; Chakraborty, Sarker, & Valacich, 2007; Hilburn, Ardis, Johnson, Kornecki, & Mead, 2013; Vongsavanh & Campbell, 2008). To these scholars, a BA can find it difficult to perform at peak during RE if their organization has not clearly defined the competency they need. Therefore, in this study, we focus on identifying the relationship between BAs' competency and the RE activity. In doing so, we focus on helping to improve the RE activity and, consequently, IS projects' success rate. Thus, we examine:

RQ: How does BAs' competency impact RE?

To achieve this objective, we conducted a controlled exploratory experimental study that involved 30 BAs from diverse industries (Babar, Wong, & Abedin, 2014). We provided the BAs with a document of stakeholders' viewpoints of a retail business scenario, and they analyzed the provided viewpoints and elicited a list of 84 requirements[1]. We used thematic-analysis techniques to analyze the elicited 84 requirements and identify the themes for different types of requirements. We categorized the BAs of varied experience into three major competency levels (i.e., senior, intermediate, and junior) and identified the levels of their association with the themes based on the BAs' level of focus on the types of IS requirements.

Our results indicate that the competency levels of BAs impact RE activity. A highly competent BA predominantly focuses on the strategic dimension of the business system, whereas BAs with middle- or low-level competency focus on the internal operations of business systems.

This paper proceeds as follows: in Section 2, we discuss the theoretical background and research focus of this study. In Section 3, we define the research method and limitations. In Section 4, we present the results we obtained from qualitatively analyzing the requirements lists by using a thematic-network approach (Attride-Stirling, 2001; Rene & Taylor-Powell, 2003). In Section 5, we present the analysis and results of the study and, in Section 6, discuss the study's contributions. In Section 7, we conclude the paper and suggest further research directions.

[1] For our requirements list, requirements selected from a viewpoint constitute a requirements list. For example, if a BA selected requirements from two viewpoints, we categorized the BA as developing two requirements lists.

2 Background: Theoretical Foundation and Research Focus

RE refers to the process of identifying stakeholders' needs and documenting them in a form amenable to analysis, communication, and the subsequent implementation of information systems (Nuseibeh & Easterbrook, 2000). In the last two decades, the RE process has evolved immensely from formal and structured to informal and agile and from a local to a global scope. The evolution of this RE process requires BAs to work in an integrated and cross-functional environment in order to collect the requirements from a system's stakeholders who reside in a variety of social and cultural setups (Bjarnason, Wnuk, & Regnell, 2011).

2.1 Traditional RE

Traditional RE is a structured approach that focuses on detailed upfront documentation and stakeholders' approval or sign off (Coulin, Zowghi, & Sahraoui, 2006). One can trace the history of traditional RE to the 1980s when it emerged in response to the so-called "software crisis" (Page-Jones, 1980). A number of traditional waterfall RE methods and techniques emerged during the 1980s and 1990s (Alexander, 1997), such as documentation reviews, process reviews, workshops, interviews, focus groups, and surveys to elicit requirements in terms of use cases, scenarios, objects, entities, and aspects (Maiden & Rugg, 1996; Rashid, Moreira, & Araujo, 2003). Traditional RE is often considered a process-centric and mechanical- and documentation-driven bureaucratic approach. Traditional RE works well in situations with fixed requirements or when one knows the requirements up front. Further, a strong focus on the process and documentation tends to overlook the most important human or people factor.

2.2 Agile RE

Practitioners considered traditional upfront detailed documentation-driven RE too inflexible to deal with new ways of working and living and with the always changing business and technological environment (Gill & Bunker, 2013). As such, more flexible and agile approaches emerged (Agile Manifesto, 2001; Sommerville, 2005). The agile movement resulted in a number of new agile RE methods (e.g., XP, scrum) and techniques (e.g., epics, user stories, user story maps, personas) for just-in-time requirements elicitation (Qumer & Henderson-Sellers, 2008). These methods and techniques (practices) are guided by the widely accepted four agile values and 12 agile principles (Agile Manifesto, 2001). Agile RE manifests "individuals and interaction over processes and tools, working software over comprehensive documentation, customer collaboration over contract negotiation, and responding to changes over following a plan" (Agile Manifesto, 2001). Agile RE enables flexibility by cordially accommodating changes to the project requirements. Instead of detailed upfront fixed requirements, agile RE focuses on eliciting requirements at a high level, and the details of such requirements emerge as the project progresses in small iterations (Elshandidy & Mazen, 2013; Inayat, Salim, Marczak, Daneva, & Shamshirband, 2014). Therein, an organization initially defines IS requirements at a high level in collaboration with the customers, and then the organization prioritizes these high-level requirement statements or user stories and captures them in a project-requirements backlog. The organization selects requirements for only upcoming iterations from the project backlog and then details them to develop the project incrementally. BAs work closely with customers (e.g., on-site customer) to continuously elicit, detail, and validate the requirements and project deliverables or components. Agile RE is considered a more human or customer-centric approach. It mainly focuses on active customer engagement and collaboration as opposed to detailed upfront documentation, which draws our attention to the importance of the people who actually have the competency to deliver the project with minimal documentation (Agile Manifesto, 2001). However, agile RE does not explicitly or in detail (to any extent) discuss the competency of BAs in such an active collaborative environment, which we identify as a research and practice gap.

2.3 Global RE

The most recent wave of outsourcing or global IS development claims to offer several benefits over onshore IS project development, such as the opportunity to involve the most appropriate people around the world, lower costs, and a faster time to market (Alzoubi, Gill, & Al-Ani, 2016). Global IS teams or team members could be located in different geographically dispersed locations in the same or different time zone or country. Despite the lucrative benefits, RE, in the context of global IS development, poses several challenges that concern, for example, language, culture, communication, and collaboration (Babar & Lescher, 2013; Damian, 2007). RE in the global context differs significantly from RE practices in the local context. One major factor that contributes to this difference is that the stakeholders in the global context

are often spread across various geographical and cultural environments. One needs to carefully select and prepare employees to deal with the complexities of global IS development projects (Babar & Lescher, 2013). As such, we see the need for team members to have the appropriate competency for global IS development, which involves global project management, requirements analysis, software architecture, and testing.

In short, agility and global system development are the two contemporary RE trends. These trends have made RE a complex and challenging phenomenon. Identifying the right employees for the right jobs has contributed to the complexity of the RE phenomenon. These trends clearly indicate the need for people with the right competency to deal with the challenge of agility and globally distributed IS development. We need further empirical research to investigate the importance of BAs' competency and their impact on RE and IS projects overall (Alzoubi et al., 2016; Appan & Browne, 2012; Arsanjani, 2005).

2.4 BAs' Competency

Due to globalization and the evolution of RE, the BA role has increased in importance for IS projects to succeed (Bjarnason et al., 2011). The top BAs are organized and great communicators with an ability to distil critical information from stakeholders spread around the world. In an agile environment, BAs are the mentors/coaches on project teams; however, not every BA is necessarily qualified to become a communication mentor (Arsanjani, 2005; Vongsavanh & Campbell, 2008). Identifying the appropriate knowledge, abilities, and years of experience required to achieve peak performance is a challenging task that demands that one thoroughly understands the problem space and its stakeholders. Since the notion of comparing the performance between experts and novices in the social psychology discipline appeared, research on "degree of competency" has played an important role in management and social science disciplines (Sedera & Dey, 2008). Degree of competency is associated with knowledge, skills, and abilities, which one can classify into three categories: novice, intermediate, and expert (Sedera & Dey, 2008; Vongsavanh & Campbell, 2008). An expert holds the highest level of competency because they have prolonged or intense experience through practice and education in a particular field (Eriksson & Charness, 1994; Chi, Glaser, & Farr, 1988; Leplat, 1986; Ulrich, 2013). Moreover, experts carry recognized knowledge and abilities to comment authoritatively on issues and specific facts. However, novices have the knowledge of factual and context-free rules attained through training, typically at the early stage of their career. They generally do not have discretionary judgement. In between these two extremes is an intermediate level of competency (Sedera & Dey, 2008). With respect to our objectives in this paper, we categorize competency, which refer to an individual's knowledge, skills, and abilities, into novice, intermediate, and expert. The literature generally suggests "years of experience" as a proxy measure for degree of competency. In relation to the three categories of professionals, researchers argue that it takes 10 years to become an expert from the time at which one initiated practice in a particular context, whereas a novice has less than four years of experience (Blömeke, Zlatkin-Troitschanskaia, Kuhn, & Fege, 2013; Sedera & Dey, 2008; Simon & Chase, 1973). Data from a wide variety of domains such as music (Sosniak, 1985), mathematics (Gustin, 1985), tennis (Monsaas, 1985), and swimming (Kalinowski, 1985) support this classification. Thus, in relation to our study's objectives and scope, we classify BAs' competency into three categories (i.e., expert, intermediate, and novice) based on their years of professional experience. We consider BAs with more than ten years of professional experience as experts, less than four years as novices, and between ten and four years as intermediate (Brûlé, 2005; Chakraborty et al., 2007). Table 1 defines these three competency categories, which act as a reference point to evaluate BAs' performance in requirements gathering. In this paper, we acknowledge various concepts associated with competency; however, for our study's scope, we adopt the concept described in Table 1.

Table 1. Three Categories of BAs Based on Their Competency (Dreyfus & Dreyfus, 1982)

Competency level	Description
Junior (novice)	Rule-based behavior, strongly limited and inflexible
Intermediate	Incorporates aspects of situation
Senior (expert)	Has an intuitive understanding of the situation and zooms in on the central aspects

3 Study Design

As we discuss in Sections 1 and 2, we investigate the relationship between BAs' competency and RE in this paper. To do so, we conducted an exploratory empirical study in which BAs collected requirements from the viewpoints of the key stakeholders of a medium-sized business organization with 400-500 employees and US$60 million revenue per annum. Figure 1 depicts the main phases of the research process.

3.1 A Viewpoint Approach

A business system involves both business and system concepts. A viewpoint essentially refers to a stakeholder's idea about a business system (Easterbrook, Yu, Aranda, & Fan, 2005; Finkelstein & Sommerville, 1996). It refers to partial knowledge of the information system. RE has used viewpoints for various reasons, such as to act as entities in a system's environment and to represent different classes of users (Easterbrook et al., 2005; Sommerville & Sawyer, 1997). Developing large and complex systems necessarily involves many stakeholders who each have their own viewpoint on the system based on their skills, responsibilities, knowledge, and expertise (Easterbrook et al., 2005; Finkelstein, 1992; Sommerville & Sawyer, 1997). A viewpoint-based approach to RE recognizes this assertion and argues that one cannot discover IS requirements from only a single viewpoint but that one needs multiple different viewpoints (Easterbrook et al., 2005).

We used a modified version of a business case (see Appendix A) to extract key stakeholders' viewpoints. We modified the business case based on our industry and research experience. We created this scenario to simulate the real situation of a business environment in which a story that presented the external and internal perspectives of the medium-sized organization described the story. The business scenario highlighted the critical aspects, such as the strategic, tactical, and operational aspects of the business system that we considered necessary to evaluate the BAs' performance during RE activity. Research and practice have often used scenarios, and they are easy to use for RE (Jarke, Bui, & Carroll, 1998). Practitioners generally complain about large scenarios that are often complex and not well structured (Achour, Rolland, & Souveyet, 1998; Godet, 2001; Rosson & Carroll, 2002). A scenario does not have to be complete because it can still give the reader an intuitive picture of the business system, such as when a reader focuses on the critical aspects of a system without really requiring a complete description of it.

3.2 Development of Viewpoints

Since the business case represented a medium-sized organization, we developed 10 viewpoints of the 10 key stakeholders that represented various organizational levels. The stakeholders comprised a chief information officer (CIO), an enterprise architect (EA), an accountant, a business executive, a business director, a sales manager, a marketing manager, a store manager, an end user, and a supplier. We could have identified more stakeholders to develop more viewpoints; however, according to several researchers (e.g., Sommerville & Sawyer, 1997), identifying too many viewpoints leads to difficulty in managing the information generated and prioritizing the IS requirements. Viewpoint-based approaches do not offer any criteria for selecting stakeholders. Therefore, we selected the 10 stakeholders and developed their viewpoints based on the experience of four individuals who participated in our study as a panel (two panel members were senior lecturers, and two were senior BAs with over ten years of industry experience). To avoid bias in data collection, these panel members did not participate in RE activity. Appendix B shows the viewpoints of the three stakeholders.

3.3 Recruiting Participants

To collect the IS requirements from the provided viewpoints, we randomly emailed and/or called 52 BAs who worked in various Australian companies and invited them to participate in the study. In the first contact, we informed the BAs that, if they accepted, they would be involved in a two-hour RE activity and the findings may help to identify the right BAs for the right jobs, improve RE, and reduce IS project failures. In response, 25 BAs consented to participate in the study and five more BAs made themselves available to participate in the study when we sent a reminder email the following week. Altogether, 30 BAs participated in this study from the following industries: telecommunication, finance, transportation, academia, and software. The companies they worked at included IBM, Hewlett Packard, Commonwealth Bank, ANZ Bank, ING Insurance, AAMI Insurance, Optus, and NSW State Transit. The experience of the BAs ranged between three to 12 years in business analysis, design, and implementation of information systems.

3.4 Dividing Participants and Viewpoints into Two Groups

The participants (30 BAs) dedicated two hours to collect IS requirements. However, the study panel did not consider it practical that each participant would be able to collect requirements from all 10 viewpoints in two hours. Therefore, we randomly divided the 30 BAs and 10 viewpoints (of the 10 key stakeholders) into two equal groups, which provided each participant the opportunity to collect requirements from a maximum five instead of 10 viewpoints in two hours. We gave each group an arbitrary name (e.g., BAG-1 and BAG-2 for the BA groups and VIEW-1 and VIEW-2 for the two viewpoint groups).

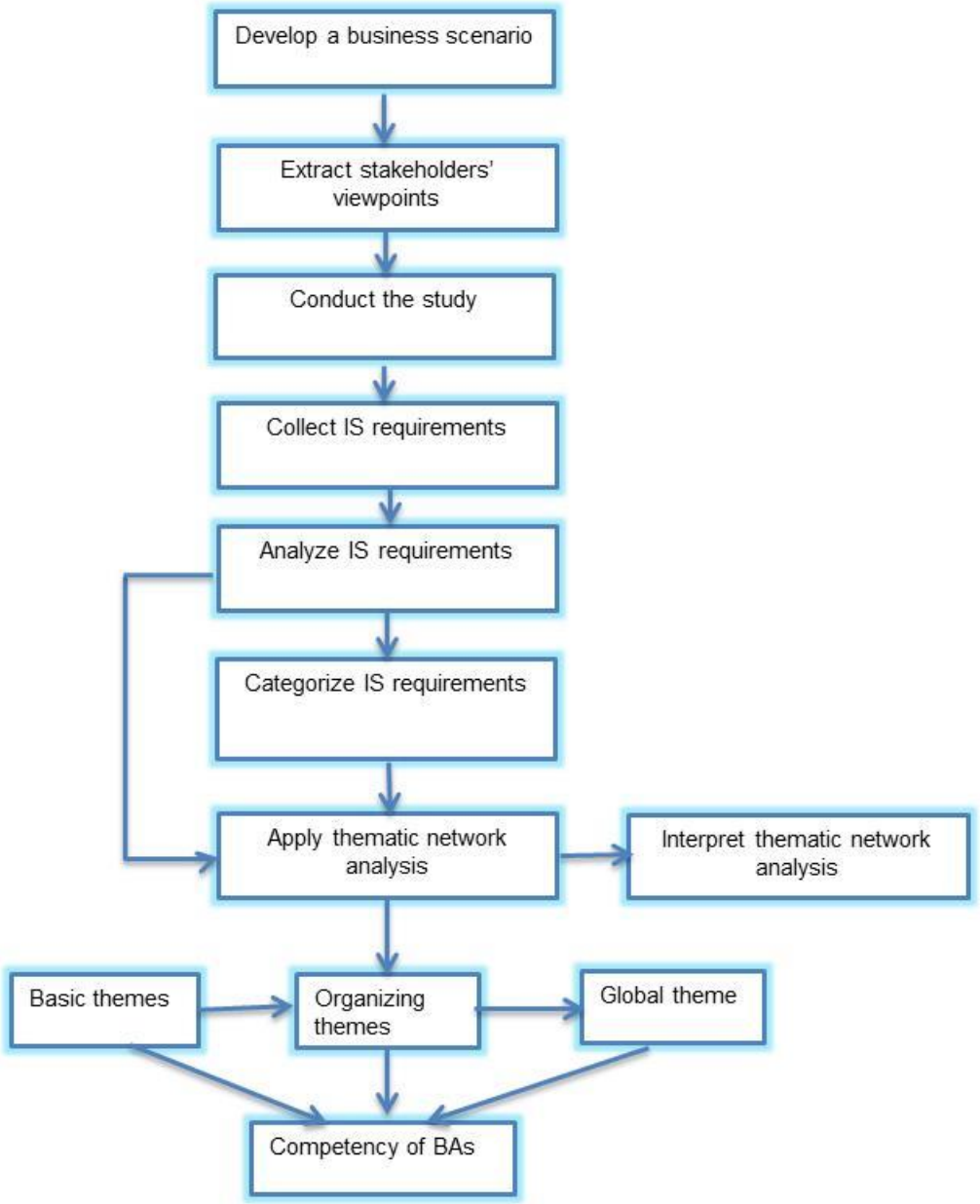

Figure 1. Research Process: Main Phases

3.5 Conducting the Study

We conducted the exploratory study in the boardroom of the Faculty of Engineering and Information Technology (FEIT) at the University of Technology Sydney (UTS), Australia. The participants gathered in the FEIT boardroom on a particular day and time that they agreed on. We divided the participants into two groups based on the approach we describe in Section 4. We separated the participant groups (BAG-1 and BAG-2) from each other in the room to better manage the RE activity. We asked the members of each

group to choose from a list of five stakeholders whom they would like to meet to collect the system requirements. They wrote their choices down. We provided them with the viewpoints of their selected stakeholders to collect requirements. To avoid time lag bias, both groups (BAG-1 and BAG-2) started collecting requirements concurrently from their selected stakeholders (BAG-1 to VIEW-1 and BAG-2 to VIEW-2).

Before the RE activity started, we briefly introduced both groups to the study's purpose and processes. We informed them about the growing issue of poor RE, the rate of IS project failures, and the growing responsibilities of BAs in the face of complex system development. We also informed them that researchers and practitioners are increasingly blaming BAs for poor RE and question the BAs' competency. Finally, we informed the participants that we were investigating the relationship between BAs' competency and RE in the study.

We required each participant in both groups to collect at least five requirements from each of their chosen viewpoints so that we could collect a suitable number of requirements in the two hours. Note that we called the IS requirements collected from a viewpoint a "requirements list"; in other words, requirements collected from two viewpoints constituted two requirements lists. By considering the requirements in the form of a requirements lists, we could more easily assess the performance of each BA in relation to RE from the viewpoints of the stakeholders at various levels. We provided the participants with paper to keep the requirements lists separate from each other. The majority of participants completed the RE activity between one and two hours. We recorded no unusual events during this activity.

4 Data Collection and Analysis

Altogether, the 30 BAs developed 84 requirement lists. We used a thematic analysis to analyze these 84 requirements lists. Thematic analysis is the most common form of analysis in qualitative research. It emphasizes identifying, examining, and recoding themes in the data. Thematic analysis goes beyond simply counting phrases or words in the text; rather, it focuses on identifying implicit and explicit ideas in the data (in this case, the requirements lists). Coding is the basic step in developing themes in the raw data by recognizing important moments in the data and encoding it prior to interpretation. The interpretation involves comparing theme frequencies, identifying theme co-occurrence, and identifying the relationships between different themes. Thematic analysis adopts the concepts of supporting assertions with data from grounded theory to construct theories grounded in the data themselves. The thematic analysis reflects a sense of control and order because the method involves reading text, identifying possible themes, comparing and contrasting themes, and building theoretical models.

To analyze the IS requirements lists for this paper, we applied the thematic network-analysis approach (Attride-Stirling, 2001) along with the four-stage qualitative data-analysis process that Rene and Taylor-Powell (2003) outline. The thematic network analysis process includes the following activities (Attride-Stirling, 2001):

- Identifying the category codes and underlying concepts
- Identifying the themes (e.g., basic, organizing, and global)
- Developing the thematic network
- Describing the thematic network
- Summarizing the thematic network, and
- Interpreting the thematic network.

We performed these activities through four stages of the qualitative data analysis process proposed by (Rene & Taylor-Powell, 2003) as follows:

- Stage 1: collect and analyses requirements lists
- Stage 2: categories data (e.g., coding of categories and concepts)
- Stage 3: apply thematic analysis, and
- Stage 4: interpret the thematic analysis.

Table 2 details the entire process.

Table 2. Data Collection and Analysis Process

No.	Stages	Description
1	Collect and analyze requirements lists	Approach each BA involved in RE activity Collect all the IS requirements lists developed by the BAs (Table 3) Read every IS requirement in the lists Segment each requirement list in a set of statements and then group those statements to further analyze them to answer the research question
2	Categorize data (coding)	Read the segmented requirements lists and extract the concepts and the knowledge embedded in the requirements lists to answer the research question Identify key categories based on the extracted concepts and knowledge. Label the identified categories
3	Apply thematic analysis	Analyze the meanings of the concepts and categories to extract basic themes (Table 6) Identify the relationships among the related basic themes and group them into organizing themes (Table 7) Identify the relationships among the organizing themes and then group them into a global theme (Table 7) Analyze the industry experience of the BAs and group them into the three competency categories (Table 4) Identify the relationship between the basic themes and the BA competency groups
4	Interpret the themes	Identify the "essence" of what each theme is about to determine what aspect of the data each theme captures Perform detailed analysis of each individual theme while highlighting the significant difference between the themes and how the competency of BAs are related to them Identify key points and lessons learnt Outline findings

4.1 Stage 1: Collect and Analyze IS Requirements and Data on BAs' Competency

Two groups of BAs (BAG-1 and BAG-2) collected the IS requirements from the viewpoints of their selected stakeholders in the given timeframe. In total, the BAs developed 84 requirements lists: BAG-1 developed 45 and BAG-2 developed 39 requirements lists on the provided paper sheets. The details in Table 3 indicate that eight of the 15 BAs from BAG-1 selected three or more viewpoints and the other seven BAs selected one or two viewpoints for requirements collection, which resulted in their developing a total of 45 requirements lists. Of the 15 BAs from BAG-2, seven BAs selected three or more viewpoints and the remaining eight BAs selected one or two viewpoints for requirements collection, which resulted in their developing 39 requirements lists. Among the 84 requirement lists, the BAs in aggregate selected individual IS requirements from between three to nine times in total, which means some BAs collected the maximum nine requirements and that some other BAs collected only three requirements per viewpoint.

Table 3. BAs' Selection Frequency of Viewpoints

BAG-1 BAs consulting VIEW-1 viewpoints			BAG-2 BAs consulting VIEW-2 viewpoints	
2 BAs × 1 viewpoint	2 reqs lists		4 BA × 1 viewpoint	4 reqs lists
5 BAs × 2 viewpoints	10 reqs lists		4 BAs × 2 viewpoints	8 reqs lists
2 BAs × 3 viewpoints	6 reqs lists		3 BAs × 3 viewpoints	9 reqs lists
3 BAs × 4 viewpoints	12 reqs lists		2 BAs × 4 viewpoints	8 reqs lists
3 BAs × 5 viewpoints	15 reqs lists		2 BAs × 5 viewpoints	10 reqs lists
Total	45		Total	39
Grand total = 84 requirements lists				

We considered years of industry experience to define the competency of the BAs involved in RE activity. The competency literature argues that years of experience represents a BA's level of knowledge and skills and that a particular number of years of industry experience refers to a particular level of competency of a BA in a particular domain (Eriksson & Charness, 1994).

Based on the experience profile of the 30 BAs, we identified a total of 13 types of knowledge and skills and coded them into three categories (see Table 4). For example, from analyzing the knowledge and skills of the BAs, we identified that senior BAs possess skills such as anticipating, quantifying, and resolving

problems and identifying the source of IS requirements (Sedera & Dey, 2008). Intermediate BAs employ facilitation techniques in discussing IS requirements with clients and used specific groups and collaborative methods for RE. Intermediate BAs generally possess the skills of conducting a brainstorm, implementing joint application development and rapid application development, and conducting structured walkthrough sessions with the clients. However, junior BAs possess the knowledge of factual and context-free rules attained from training, typically at the early stage of their career (Sedera & Dey, 2008). Junior BAs generally assist in RE by using a variety of basic techniques, such as interviews and surveys.

Table 4. BAs Grouped by Competency Level

Business analysts	Years of experience	Title	Skills and knowledge
4 BAs	12	Senior BAs	Intuitive understanding of the situation. Zooms in on the central point.
5 BAs	11		
5 BAs	10		
4 BAs	8		
3 BAs	7	Intermediate BAs	Incorporate some aspects of situation.
2 BAs	6		
2 BAs	5		
2 BAs	4	Junior BAs	Rule-based behavior. Inflexible.
2 BAs	3		
1 BA	2		

4.1.1 Initial Data Screening

In the first step, we (along with a research assistant) conducted a screening test of all the 84 requirements lists, as Davis, Overmyer, Jordan, and Caruso (1993) recommend, to ensure that each IS requirement in the lists was correct, unambiguous, and meaningful. The research assistant had six years of industry experience as an analyst programmer. We assessed the IS requirements to see whether they made sense and contained no ambiguity. The panel assessed the IS requirements based on Sommerville and Sawyer's (1997) criteria and found that a total of 38 requirements were incomplete or ambiguous. For example, "based on the population item can be provided" is a vague requirement and does not make sense. Another example of a broad and vague IS requirement is "linking software systems with management goals". There were 38 such examples of vague IS requirements, which we excluded from the lists. The IS requirements in the lists that emerged from data screening tests were good quality and suited the study's next step, the coding stage. Table 5 provides details of six randomly selected requirements lists out of the 84 lists.

4.2 Stage 2: Categorization of IS Requirements (Coding)

In this stage, we categorized and coded the underlying concepts embedded in the IS requirements across 84 lists. We coded the concepts mainly to reduce or group IS requirements into manageable chunks or concept categories so that we could identify the basic themes and establish the relationship between the IS requirements' themes and the BAs' competency. We analyzed each requirements list to extract concepts from a business system perspective and the emphases in the system stakeholders' viewpoints to code the requirements. For instance, many of the requirements in the lists related to the financial targets that the organization wanted to achieve with the support of the new system. A few examples of such requirements include:

- A business executive wanted to achieve "double-digit growth in two years so that the shareholders' dividend can be increased".
- A business director wanted to achieve "profitability by $100 million so that shareholder value can be increased by 10%".
- An accountant wanted to "increase productivity by 15% to achieve the profitability targets".

IS requirements related to growth, revenue, profitability and shareholder value and many other aspects of the business as mentioned in Table 6 refer to the outbound strategy of the organization. Research refers

to these requirements as the external view of the organization (Birnik & Moat, 2008; Henderson & Venkatraman, 1993; Johnson & Lederer, 2010; Porter, 1996; Ravichandran & Lertwongsatien, 2005). Therefore, in total, we identified and coded 11 concepts (as mentioned in Table 6) as external perspectives of the organization.

Table 5. Six Randomly Selected Requirements Lists

Requirements list 1 (enterprise architect's viewpoint): 1) Optimize operational cost so that the profit can be increased. 2) Share up-to-date inventory information with the supplier so that the on-time delivery of products can be achieved. 3) Just-in-time deliveries so that the wastage of products can be reduced. 4) A combined delivery system, in which products are delivered from a single warehouse, can be made. 5) Open up new stores to be more competitive in the market.	**Requirements list 4 (business executive's viewpoint):** 1) Double-digit growth in two years so that the shareholders' dividend can be increased. 2) Increase dividends so that the confidence of the shareholders is enhanced. 3) Improve services in local and overseas stores so that a competitive edge over rival franchise stores can be achieved. 4) Most conscious purchasing and resourcing so that revenue can be increased. 5) Analyze customers' buying patterns to decide what, when and whom to offer the product.
Requirements list 2 (accountant's viewpoint): 1) Perform financial transactions online to save time and money spent on offline transactions. 2) Sell products online to reduce the operational costs of the stores 3) Reduce operational costs to improve profits of the stores. 4) Improve service quality in the stores to retain customers. 5) Create a new customer base by opening up new stores	**Requirements list 5 (marketing manager's viewpoint):** 1) Provide online ordering system to reduce customer service cost. 2) Use various channels for marketing so that the maximum number of people can be reached 3) Follow customers' buying patterns to offer new products and services in the stores. 4) Enhance communication with customers for increased feedback. 5) One-stop shopping for customers for customer retention.
Requirements list 3 (business director's viewpoint): 1) Improve cost structure of the franchise so that profitability can be increased 2) Top-class control over finances of the franchise to develop a top-class reputation in the market. 3) Go online to buy and sell products so that the cost structure for the stores can be improved. 4) Double revenue growth from last year for better profitability for the franchise's shareholders. 5) Develop a culture of using analytics to define more precise strategic targets for the stores. 6) Enhance relationships with customers to improve their trust in the products and services of the stores.	**Requirements list 6 (end user's viewpoint):** 1) Collect customers' personal data so that customer profiles can be developed. 2) Collect customer purchase data so that their buying patterns in the store can be identified. 3) Transmit data to the back-end system for further analysis. 4) Use scanners to remit the data so that error-free data can be saved in the databases of the organization. 5) Manage customer data for further analysis. 6) Analyze data to observe buying patterns for products by particular age groups at a particular time. 7) Forecast customer demands so that the right products at the right time can be delivered to the store.

A vast number of requirements in the lists concerned operations and services, which are generally the focus of the inbound strategy. Research refers to these requirements as the internal perspective of the organization (Bakera & Niedermanb, 2014; Ray, Muhanna, & Barney, 2005; Tallon, 2008; Treacy & Wiersema, 1995). We analyzed all 84 requirements lists and identified 21 concepts related to the operations and services, which we coded as the internal perspective of the organization. For instance, the following three requirements from two different stakeholders refer to the customer's buying patterns based on their personal and purchase data. Therefore, these requirements and some other related requirements overall refer to the concept of "customer buying pattern", which is substantially an internal perspective of the organization as Table 6 indicates.

- A marketing manager wanted to "follow customers' buying patterns to offer new products and services in the stores".
- An end user "wanted to collect customers' personal data so that customer profiles can be developed".
- An end user wanted to "collect customer purchase data so that their buying patterns in the store can be identified".

Therefore, we identified a total of 31 concepts: 11 referred to the external perspective of the business organization and 20 to the internal perspective of the business organization. We coded all 11 concepts that referred to the outward strategy (high-level goals and objectives) of the organization as "external perspective" and the other 20 concepts that referred to the inbound strategy (operations and services) of the organization as "internal perspective".

4.3 Stage 3: Thematic Network Analysis

Once we coded the concepts behind the IS requirements, we performed thematic network analysis on the coded categories of requirements to identify basic themes. A basic theme refers to the most basic or lowest-order theme that one extracts from the textual data (Attride-Stirling, 2001)—in this case, coded text.

4.3.1 External Perspective

As Table 6 shows, we identified four basic themes to represent the 11 concepts coded as belonging to the external perspective category. We followed the following approach to identify the basic themes.

1) At the basic level, the financial view, online strategy, e-commerce, and globalization concepts indicate that an organization tends to expand its businesses globally. Thus, we used new markets as a basic theme to represent these four concepts in the external perspective.
2) Organizations often focus on customers as a core part of their business strategies. Thus, we used customer value proposition as the basic theme to represent the concepts customer-centric strategy, new customer base, and customer-satisfaction index.
3) To achieve financial targets and deliver customer value, organizations often try to create alliances and mergers. Therefore, we used the basic theme partnership to represent those two concepts.
4) Finally, organizations need to adhere to IP laws and international business laws to achieve the above-mentioned targets. Thus, we used the theme regulatory and compliance to represent those two concepts.

4.3.2 Internal Perspective

In a similar way, we identified six basic themes to represent the 20 concepts that we coded as belonging to the internal perspective category.

1) We used the theme time to market to represent the just-in-time delivery, tracking system, and information technology concepts.
2) We used the theme system policies to represent the data accessibility, privacy, safety and security, knowledge management system, and latest technologies concepts.
3) We used the theme integration to represent the systems working together, customers' buying patterns, improved communication, and research and development concepts since they all refer to the integration of systems.
4) We used the theme features to represent the top-quality control, improve service quality, and rules and policies related requirements concepts.
5) We used the theme channels to represent prompt goods and service delivery and optimize operational cost concepts.
6) We used the theme quality to represent system enhancement, customer safety, and response time-related requirements concepts.

Thus, applying thematic-analysis techniques reduced the 31 IS requirement-related concepts into a manageable set of 10 basic themes as Table 6 shows.

The basic themes are simple premises that characterize the textual data, and, on their own, they explain very little about the text or altogether a set of pieces of texts. In order for a basic theme to make sense beyond its immediate meaning, one needs to read it in the context of other basic themes. Together, they represent an "organizing theme" (Attride-Stirling, 2001).

Table 6. Coding Based on Underlying Concepts and Basic Themes of IS Requirements

Ref.	Category code	Underlying concepts or knowledge	Basic theme (IS requirements)
1	External perspective	Financial view Online strategy Globalization E-commerce strategy	New markets
		Customer-satisfaction index New customer base Customer-centric strategy	Customer value proposition
		Alliance strategy Possibilities of mergers	Partnership
		IP laws International business laws	Regulatory & compliance
2	Internal perspective	Information technology Just-in-time delivery Tracking systems	Time to market
		Data privacy Data security System accessibility Knowledge management system Latest technology	System policies
		Systems working together Customers' buying patterns Communication improvement Research and development	Integration
		Top quality control Improve service quality Rules and policies related requirements	Features
		Prompt goods and service delivery Optimize operational cost	Channels
		System enhancement Customer safety Response time-related requirements	Quality

Then, we analyzed these 10 basic themes and grouped them into two organizing themes (business view and system view) in order to further enhance their meaning. An organizing theme is a cluster of themes that share the same meanings, issues, arguments, and assumptions (Attride-Stirling, 2001). For instance, four basic themes from the external perspective (i.e., new markets, customer value proposition, partnership, and regulatory and compliance) overall refer to the business view of the organization, which concerns an organization's identifying longer-term business goals (Table 6). In contrast, the basic themes from the internal perspective (i.e., time to market, system policies, integration, features, channels, and quality) overall present the system view of the organization, which concerns an organization's developing operations and service-related issues and concerns. By doing so, we reduced the 10 basic themes into a manageable set of two organizing themes that summarized the 10 basic themes.

Finally, we grouped these two organizing themes into the global theme enterprise IS requirements. A global theme comprises organizing themes that share the same meanings, issues, arguments, and assumptions. For instance, both organizing themes (business view and system view) refer to the enterprise environment and the requirements that emerge from it. Therefore, we grouped both organizing themes under the enterprise IS requirements theme.

By conducting a thematic analysis, we could transform simple requirements lists and knowledge from concepts to meaningful global themes. In this transformation, we linked concepts to basic themes, which we consequently linked to organizing and then global themes in a hierarchical manner. By linking concepts and themes, we could establish the thematic network of IS requirements and BAs' competency. We created a network of relationships between the themes and competency of the BAs involved in collecting the IS requirements as Figure 2 shows. We did not consider these thematic networks in

isolation. In the light of our objectives, we considered the BA's competency and linked it to the related themes. We show and explain the thematic network in Section 5.

4.4 Stage 4: Interpretation of the Thematic Network Analysis

Finally, we interpreted the thematic network to identify the relationship between BAs' competency and RE based on the data and the lessons the BAs learned, which we present in Section 5

The first author originally defined the concept, categories, themes, and their relationships. However, how one codes and labels categories, concepts, and themes extracted from the requirements lists is subject to misjudgment and misunderstanding (Miles & Huberman, 1994; Weber, 1990). Thus, we all refined and re-adjusted them during the study with an iterative approach to avoid any possible omissions, errors, and coding bias.

5 Analysis and Results: Emerging Themes in IS Requirements

In this section, we present the details of the analysis and results that collectively form the conceptual model of emerging themes in IS requirements.

The requirements in the lists referred to various aspects of Five Star's (the name of the organization in our business scenario; see Appendix A) business system. For example, some of the requirements in the lists were related to online business, others were related to online transactions and, others still were related to customer service. So, we grouped the requirements that stressed moving the business online under the concept online strategy, the requirements that stressed online financial transactions under the concept e-commerce strategy, and the requirements that focused on products and services for customers under the concept customer value proposition. Therefore, based on this approach, we categorized the requirements across all 84 lists into 31 concepts: we grouped 11 concepts as belonging to the external perspective and 21 concepts to the internal perspective.

As we discuss in Section 3, we then conducted a thematic analysis to discover the basic themes of the underlying 31 concepts. For instance, in the external perspective category, we grouped customer-centric strategy and customer-satisfaction index under the basic theme customer value proposition. This grouping suggests that both customer-centric strategy and customer-satisfaction index tend to deliver an organization's customer value proposition. The identified basic themes (see Table 6) are the lowest-level abstract characteristics of the data that summarize the identified concepts.

In relation to the perspectives and emphases, many requirements in the lists focused on the efficiency, functionality, and quality of the business operations. For instance, we analyzed all the requirements related to control (real-time inventory control, using GPS technologies to control deliveries, and reduce lost opportunities in the stores) and grouped them under the concept top-quality control. For example:

> A store manager wanted an "on-time ordering system so that deliveries can be made on time to the store".
>
> An end user wanted "deliveries to be on time to avoid lost opportunities".
>
> A store manager wanted to "use the GPS system for better tracking of the delivery trucks".

We grouped such requirements under an organization's internal perspective (i.e., its internal services and operations). Similarly, we grouped many other requirements (shown in Table 6) that referred to efficiency, functionality, and quality under the internal perspective. As we discuss in Section 3, we then applied thematic-analysis techniques to discover basic themes of the underlying concepts and what knowledge they provided. For instance, we grouped the concepts data privacy and data security under the basic theme system policies. In this case, by using thematic analysis, we could better consolidate dispersed information into meaningful concepts and then consequently into basic themes.

In the next step, we analyzed the relationship between the basic themes and grouped them under organizing themes (see Table 7) in order to enhance their meaning. For instance, the basic themes of internal perspective (new markets, customer value proposition, partnership, and regulatory and compliance) refer to an organization's longer-term business goals. Therefore, we grouped these four basic themes under the business view organizing theme (see Section 3 for details). Similarly, we grouped basic themes related to operations and services under the system view organizing theme because they referred to an organization's tactical and operational goals. Finally, we grouped two organizing themes into the

enterprise IS requirements global theme because the business view and system view organizing themes together refer to the entire enterprise. Global themes summarize the organizing themes. The hierarchy of the themes (basic -> organizing -> global) represent the thematic network (see Figure 2).

Table 7. Perspectives and Emphases of Requirements Lists: Basic to Organizing into Global Themes

	Basic theme	Organizing theme	Global theme
1	• New markets • Customer value proposition • Partnership • Regulatory & compliance	Business view	Enterprise IS requirements
2	• Time to market • System policies • Integration • Features • Channels • Quality	System view	

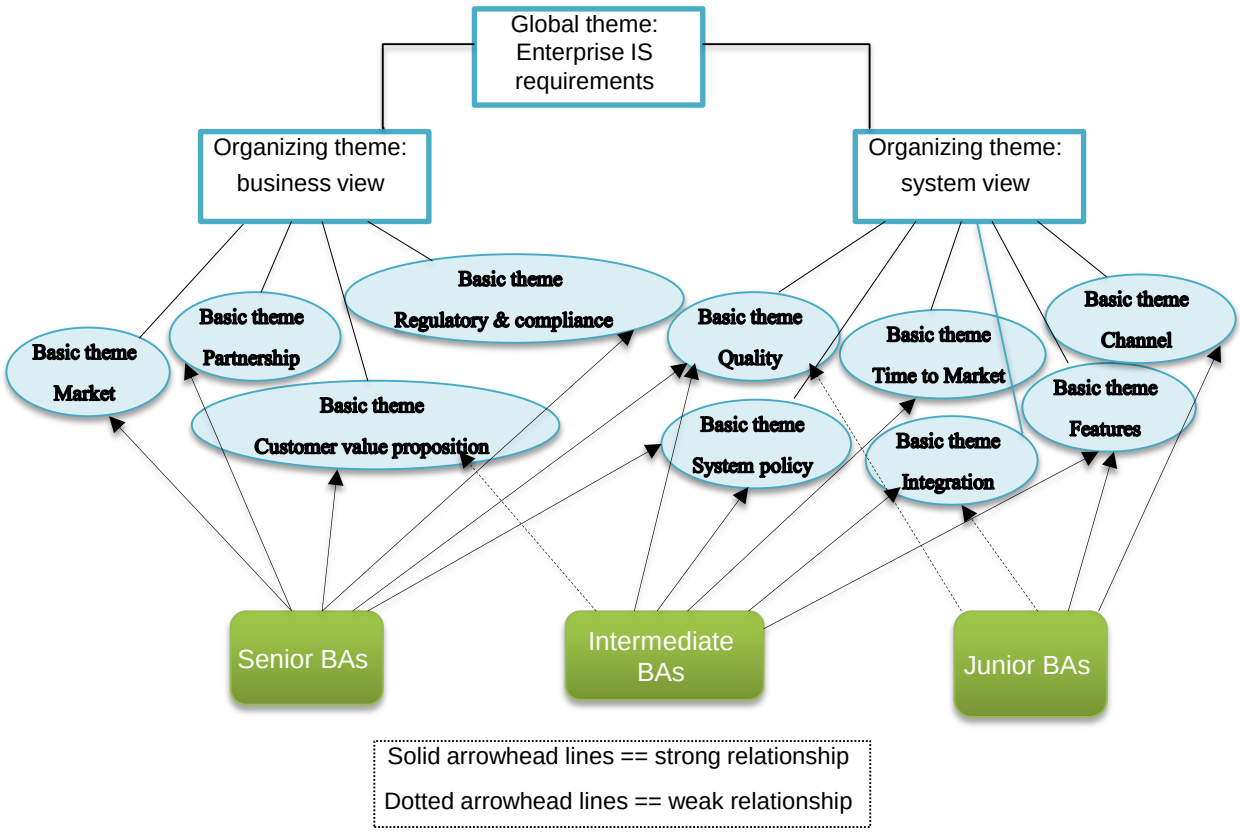

Figure 2. Relationship Between BAs' Competency and IS Requirements Themes

5.1 Relationship between BAs' Competency and RE

Since we focus on the relationship between BA's competency and RE in this study, we analyzed the BAs' competency and related it to the basic themes of the IS requirements (see Figure 2). The details of all the 30 BAs highlight that the senior BAs approached more stakeholders for IS requirements than intermediate and junior BAs. For instance, senior BAs approached a total of 55 percent (46) of the 84 stakeholders for IS requirements; however, intermediate BAs approached only 25 percent (21), and junior BAs approached 20 percent (17) of the 84 stakeholders for IS requirements.

After careful consideration, we divided the type of relationships between the BAs' competency and IS requirements themes into three categories: strong, weak, and non-existent. We classified a BA who collected more than 10 types of IS requirements per each basic theme as indicating a strong relationship between the BA's category (senior, intermediate, or junior) and the corresponding basic theme. Similarly, we classified a BA who collected three to 10 types of requirements per each basic theme as indicating a weak relationship between the BA's category and the corresponding basic theme. Lastly, we classified a BA who collected two or fewer IS requirements per each basic theme as indicating a non-existent relationship between the BA's category and the corresponding basic theme. Recall that the BAs collected at least five requirements from each of their chosen viewpoints and that we called the IS requirements from each BA a "requirement list"; see Table 8 for the total number of requirements they selected. From analyzing the IS requirements, we can see that senior BAs collected more than 10 IS requirements for the four basic themes in the external perspective and two basic themes (quality and system policies) in the internal perspective. For some basic themes (e.g., customer value proposition and quality), the senior BAs collected up to 30 IS requirements per basic theme. Therefore, the relationship between these six IS requirements basic themes and the senior BA category was strong, which we represent with solid arrow headlines (see Figure 2).

The results also indicate that intermediate BAs collected more than 10 IS requirements related to five basic themes (quality, system policies, time to market, integration, and features) in the internal perspective and some IS requirements related to the basic theme customer value proposition in the external perspective. Therefore, the relationship between the intermediate BAs and the five basic themes in the internal perspective was strong; the relationship between the intermediate BAs and the basic theme customer value proposition in external perspective was weak (three to 10 IS requirements), which we represent with a dotted arrowhead line. Similarly, the junior BAs collected more than 10 IS requirements related to the basic themes features and channels. However, they collected only three to 10 IS requirements related to the basic themes quality and integration. The junior BAs did not collect IS requirements related to the four basic themes in the external perspective and two basic themes in the internal perspective (i.e., time to market and system policies). Therefore, we show no relationship between these IS requirements themes and the junior BAs in the network diagram (see Figure 2).

In this section, we discuss the identified global, organizing, and basic themes of IS requirements and their relationship to each other and BAs' competency level (e.g., senior, intermediate, and junior) from both the practical and research perspectives. The global enterprise IS requirements theme includes both the high-level strategic business view and detailed system view organizing themes. The system view represents the detailed technical requirements (operations and services) that support the strategic high-level IS requirements the business view. One can see these IS requirements themes as different types of IS requirements in the overall global enterprise IS requirements theme. Further, we relate or link these IS requirements themes to the BAs' competency levels. The relationship or link (strong or weak) indicates how strongly the BA's competency level (e.g., senior, intermediate and junior) related to whether the BAs elicited certain types of IS requirements.

5.2 Business View

The business view represents the high-level strategic business requirements that the system (system view) needs to support). The business view organizing theme includes four basic themes: market, partnership, customer value proposition, and regulatory and compliance.

The new market theme is a broader area of strategic business requirements. It refers to the business environment in which the business operates. We identified the new market theme based on business requirements that focused on the market, such as the strategic requirements that focus on new markets, including e-commerce and an online presence to sell and exchange products or services (e.g., a requirement identified by one of the senior BAs stated: "We want to reach out to Europe for our products and services"). Based on the thematic analysis, we found that senior BAs had a strong relationship (solid arrow in Figure 2) with strategic market-related IS requirements. The market provides opportunities that enable businesses to form partnerships with other businesses that operate in the market. We identified the partnership theme based on the IS requirements related to strategic business alliance and mergers for a competitive advantage (e.g., a requirement that one of the senior BAs identified stated: "Contact other companies for new products and services"). The thematic analysis (see Figure 2) results indicate that senior BAs had a strong relationship with the strategic business partnership-related requirements.

An organization's customer value proposition in the market (Anderson, Narus, & Rossum, 2006) refers to the competitive prices and compelling business benefits of products or services that it delivers to its existing or new customers. The customer value proposition theme represents strategic requirements that focus on customer centricity (e.g., customer-centric strategy, new customer base, customer-satisfaction index) and on, for example, exceeding customers' expectations (Anderson et al., 2006). The thematic analysis (see Figure 2) results show that senior BAs had a strong relationship with the strategic business partnership-related requirements. Further, one can observe from the thematic analysis that the intermediate-level BAs had a weak relationship (dotted line) compared to senior BAs with the customer value proposition-related requirements, which suggests the overlapping nature and link between the senior and intermediate level BAs.

Organizations need to provide more than simply a customer value proposition for their products/services: they need to ensure that business offerings comply with regulatory and compliance-related requirements. For instance, banks offer financial products and services that need to comply with local and international (if a multinational bank) regulatory and compliance requirements. The regulatory and compliance basic theme represents requirements related to investors' and customers' financial transactions, health and safety regulations, and IP laws. The thematic analysis (see Figure 2) results show that senior BAs had a strong relationship with the strategic regulatory and compliance-related requirements.

5.3 System View

The system view represents the system requirements that an organization needs to support and realize its business requirements (business view). The system view organizing theme includes six basic themes: system policies, time to market, integration, features, channels and quality. We identified these themes based on analyzing the IS requirements (see Figure 2).

Quality refers to a system with acceptable quality (as defined by the customer or end user) that an organization is developing or sourcing from elsewhere to support or realize its business requirements. System policy refers to the rules that the system design embeds for the organization to meet the business constraints. Time to market refers to the speed and timeframe at which an organization can release and make available a system in the production environment for the business to use. A system's functional behavior constitutes its core, which the features theme represents. Finally, an organization can make a system available for others to access via a range of channels such as the online or offline channel, mobile and desktop channel, and so on. Thus, we can see that, compared to the business view, the system view more resembles a solution view.

Further, we can see from the system view theme analysis (Figure 2) that the intermediate and junior BAs focused more on low-level system or solution requirements compared to senior BAs. Having said that, the senior BAs *did* engage at the system level to some extent: they selected requirements related to system quality and policy in the overall system view. Further, the junior BAs had a strong relationship with and focused (compared to senior and intermediate BAs) on eliciting system features and channel-related requirements.

The results of the thematic analysis provide several insights. First, they highlight the competency level (senior, intermediate, junior) that a BA requires to elicit high-level strategic and low-level system solution-focused requirements. Second, they highlight how BAs at different competency levels overlap in what requirements they elicit. Third, they highlight the strong and weak relationships between BAs' competency level and types of IS requirements they elicit. Organizations may use our findings as a guide to allocate the appropriate resources (BAs) with the appropriate level of competency for the relevant types of IS requirements' elicitation. For instance, organizations may consider involving senior BAs rather than intermediate BAs when they need to elicit high-level strategic business view-related requirements. Similarly, organizations may consider involving more intermediate and junior BAs than senior BAs when they need to elicit system-level solution-focused IS requirements. Finally, based on the thematic analysis, we can suggest that, given that the senior, intermediate, and junior BAs had strong and weak relationships with different types of IS requirements, they need to work together at different levels to elicit the different types of IS requirements among the overall enterprise IS requirements. In summary, our thematic analysis suggests that there are ten important basic themes of IS requirements. Not all the BAs focus on the IS requirements related to all these ten themes. Senior BAs focus more on IS requirements related to an organization's external perspective, whereas intermediate and junior BAs focus more on IS requirements related to an organization's internal perspective.

6 Discussion and Analysis

This research offers several theoretical and practical insights and contributions, which we discuss in detail below.

6.1 Theoretical Contribution

This study makes two primary theoretical contributions: a thematic network model and a thematic network-development method (practices).

6.1.1 Thematic Network Model

In this study, we develop a thematic network model that reveals the relationships between BAs' competency and types of IS requirements based on an empirical study. The thematic network (see Figure 2) highlights the relationships between the three types of BAs and business and system-oriented requirements. We discuss the empirical study here to highlight its theoretical contributions.

Our study involved practitioners (30 BAs) as research participants who collected a total of 392 requirements in 84 requirements lists. The BAs adopted a viewpoint-based approach (a highly commendable approach for controlled experiments) (Easterbrook et al., 2005; Finkelstein & Sommerville, 1996) in which we provided BAs with viewpoints to collect requirements. In total, 18 senior, seven intermediate, and five junior BAs participated in the study. The statistical analysis (see Table 8) indicates that senior BAs selected 55 percent of the total number of viewpoints (84) compared to 25 and 20 percent by intermediate and junior BAs, respectively. The high percentage (55%) for senior BAs naturally results from the large number of senior BAs (18) involved in the study compared to the number of intermediate (7) and junior (5) BAs. However, the statistics provided in Table 8 indicate that each BA from all three categories, on average, selected three viewpoints, which means they did not differ in the number of viewpoints they selected. The statistical analysis of the data also indicates that senior BAs collected 213 requirements in their 46 requirements lists (i.e., 55% of the total number of requirements (392)). The intermediate BAs collected 98 requirements and the junior BAs collected 81 requirements in total (25% and 21%, respectively, of the total number of requirements (392)). However, on average, the junior BAs collected 16 requirements and the intermediate BAs collected 14, whereas the senior BAs collected 12 on average. This finding indicates that junior and intermediate BAs had a higher requirement selection rate overall than the senior BAs. Thus, we found little difference between the BAs based on the measures in the first five columns in Table 8 after competency level (i.e., number of viewpoints selected to how often the BAs selected the requirements).

Table 8. Statistical Analysis of the Collected Requirements by the BAs

Competency level	Number of viewpoints selected	Average number of viewpoints per BA	Total number of requirements collected	Average number of requirements collected/BA	How often the BAs selected requirements	Number of business and system requirements	
						Business	System
18 senior BAs	46 (55%)	3	213 (54%)	12	4 to 9	133 (62%)	80 (38%)
7 intermediate BAs	21 (25%)	3	98 (25%)	14	3 to 8	26 (9%)	73 (74%)
5 junior BAs	17 (20%)	3	81 (21%)	16	4 to 9	0	81(100%)

Further, junior and senior BAs selected between four and nine requirements, and the intermediate BAs selected between three to eight requirements. Note, a highly skewed distribution of the three groups (18 senior BAs, seven intermediate BAs, and five junior BAs) could have impacted the resulting thematic network model. However, Table 8 indicates that all individuals in the three groups were fairly consistent (on average) in the number of viewpoints they selected, total number of requirements collected, and how often the BAs selected requirements, which suggests we developed a reliable thematic network model. Despite these similarities, based on the aggregated results in Table 8 (columns two to six), we can identify differences in the last two columns (i.e., columns seven and eight): that is, in the nature of the requirements that the three different categories of BAs collected. We can see that the senior BAs focused on both business and system-oriented requirements and that the intermediate BAs also focused

somewhat on both types of requirements but more on system-oriented requirements. Surprisingly, junior BAs dominantly focused on system-oriented requirements and completely overlooked the business requirements. Thus, we can see that senior BAs were far ahead of intermediate and junior BAs in focusing on business rather than system requirements. In summary, according to the results, senior BAs collected 133, intermediate BAs collected 26, and junior BAs did not collect any business requirements (62%, 9% and 0% of the total number of requirements collected by these three BA groups, respectively). In other words, junior BAs totally focused on system or solution requirements; all the requirements they selected were system requirements. The 74 percent of the requirements that the intermediate BAs collected were system requirements, whereas only 38 percent of the total number of requirements that the senior BAs collected were system requirements. Thus, it seems that the senior BAs focus more on an organization's external business view whereas intermediate and junior BAs focus more on the internal system view (operations and services). Furthermore, senior BAs tend to collect business requirements at the level (e.g., goals) that an organization would like to achieve with developing information systems.

Note that, while business and system requirements differ in nature, they are both important in relation to developing the IS that supports business strategies. In the external perspective, business requirements refer to longer-term (e.g., 3-10 years depending on the industry) goals such as the profitability, shareholder value, and revenue targets (Bharadwaj, Sawy, Pavlo, & Venkatraman, 2013; Goldsmith, 2013). However, in the internal perspective, system requirements refer to the operations-related goals, such as the provision of services to the customers, inventory-control processes, and systems' accessibility and interoperability (Danesh & Yu, 2014; Johansson & Lahtinen, 2013). In relation to developing a system, system requirements as functional and non-functional requirements directly impact the system-development process (in other words, the organization designs and implements the system based on system requirements) (Alrajeh, Kramer, Lamsweerde, Russo, & Uchitel, 2012). However, business requirements as strategic business goals indirectly impact the system-development process. A considerable amount of management information system (MIS) (Kaplan & Norton, 1996; Kearns & Sabherwal, 2006; Reich & Benbasat, 1996) and IS development literature (Basili et al., 2010; Bleistein, Cox, & Verner, & Phalp, 2006; Singh & Woo, 2009) has recognized the importance of strategic business goals and their translation into system requirements (functional and non-functional) for effective IS alignment. According to an example that Babar, Zowghi, and Chew (2010) provide, to achieve a productivity target, an organization should focus on operational processes (reduce incidents and cost errors) for low-price and high-quality products and services for their customers before the developers of the system decide on the IS functions for service-quality analysis and a problem-tracking system that supports operational processes. These results contribute to the existing IS development literature, which does not agree on whether BAs should collect strategic business goals and on their importance in relation to developing successful systems (Babar, Wong, & Qumer, 2011). These results indicate that capturing an organization's external perspective (strategic business goals) and internal perspective (operational requirements) requires BAs at all competency levels to successfully deliver systems that enable or support a business's requirements. These results are important; thus, we present them in the thematic network model (see Figure 2). Others can extend and use this base model to design additional empirical studies to develop different theories such as the theory of human resources for IS RE or to study the relationship of BAs' competency and projects' overall performance.

6.1.2 Thematic Network Development Method

Our research process provides guidance on the best practice for collecting and analyzing data for developing IS themes. In addition to these research results in terms of the thematic network (Figure 2), we offer the following important contributions from an overall thematic network analysis method perspective.

The original thematic network analysis method mainly focuses on analyzing and interpreting activities. However, based on our study, we found that it is much more than that. Thus, based on our applying the original thematic network analysis method, we propose the following principles and a process as additional theoretical contributions to the body of knowledge on thematic network analysis.

Principles:

1. **Experimental:** thematic network development is a data-driven experimental process. Thus, instead of collecting individuals' opinions (opinion-based survey), we conducted a controlled experiment. By doing so, we could obtain first-hand data instead of secondary or opinion-based data to develop the thematic network. Although many other approaches exist, we

propose an experimental approach to directly engage practitioners in thematic network analysis in order to avoid any opinion-based bias.

2. **Subject matter experts:** our research process suggests that one should use actual practitioners or subject matter experts as research participants to collect data. BAs were the most appropriate subject matter experts for collecting requirements in our research. Involving actual subject matter experts or practitioners minimizes any chance of incorrect data collection that would adversely affect the resulting thematic network model.
3. **Cognitive process**: requirements analysis is a cognitive activity in which participants acquire and apply knowledge. Thus, we suggest that thematic network analysis underpins the cognitive input, which the collected data embeds. This cognitive input and related mental process warrant further study in this complex research area.
4. **Context awareness**: before commencing the data collection and thematic analysis, one needs to understand the context. Based on our research, we suggest that a study's participants need to have a sufficient level of context awareness for a researcher to effectively collect, analyze, and categorize themes and develop a thematic network model. Context awareness enables the participants to understand a study's scope, nature, and objectives, which helps one develop effective and viable artifacts, such as our thematic network and its interpretation.
5. **Incremental:** we developed the thematic network model incrementally through an iteration process that included analysis and interpretation steps. In this iteration process, we repeatedly analyzed and interpreted data collected from the BAs to develop the thematic network model. The data collection was one-off event and was not part of the iterative process due to the limited two-hour timeframe that the BAs had to select requirements.

Process:

In addition to the thematic network model and principles, we extracted some key processes for others to effectively execute similar research that involves thematic network analysis. Based on this study, we suggest that thematic network analysis is not a single activity but rather a complete process (see Figure 3) that we can organize into several steps.

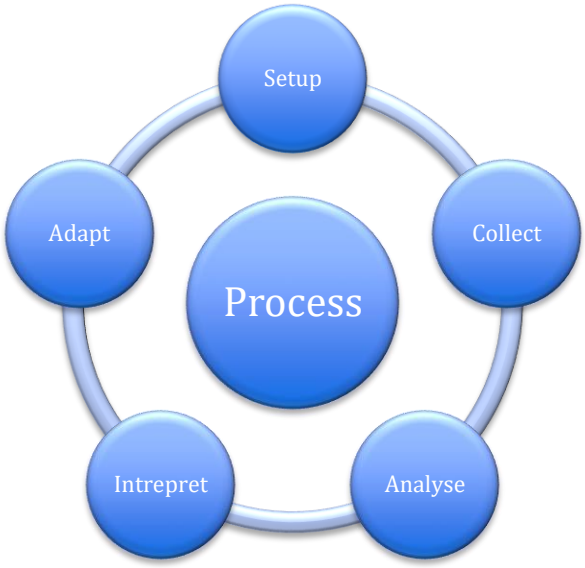

Figure 3. An Enhanced Thematic Analysis Process

1. Setup: one needs to set up the environment before collecting and analyzing data (e.g., context-awareness principles). In doing so, one will set up the experimental environment and identify the participants and assumptions to guide the study. Failure to do so may lead to undesirable results or incorrect data collection and analysis (principle four above).
2. Collect: once one has identified the environment and participants, one can begin collecting data. This stage constitutes a fundamental part of a study. Data collection requires authors to

effectively engage with research participants, to execute the experiment, and to record the data for analysis (e.g., principles one, two, and three).

3. Analyze: data analysis involves screening and analyzing in detail data to build the thematic network model. This activity is critical. One analyzes data in small increments to extract the themes from basic to global. One then presents the themes and their relationships with their strength value in the thematic network model. One continuously reviews and revises the thematic network model when developing it using feedback loops. One analyzes the data iteratively through which the thematic network model emerges through small increments. Further, depending on the study and the research project needs, one can iteratively collect and analyze data. In our case, we conducted an upfront experiment to collect the data at once, which we then iteratively analyzed. We conducted the experiment upfront because the participants were not available beyond two hours (principle five).
4. Interpret: one then interprets the generated thematic network model to provide further important insights. In this step, one extracts useful information to address the research question in hand. An interpretation could report unexpected results or insights that one may not have planned as we similarly discovered and report in this paper (e.g., the theoretical contribution to the thematic network analysis method). Further, one can perform this step in conjunction with the data collection and analysis to iteratively generate and revise findings (principle five).
5. Adapt: one can adjust the thematic network analysis process based on the overall learning and reflection as we do in this section. Based on interpreting the proposed thematic network model (Figure 2), we adjusted the thematic network analysis process in five steps as Figure 3 shows (principle five).

6.2 Practical Contribution

Practitioners can use the thematic network model to make informed decisions on sourcing the right BA for the right job. The model indicates that organizations need BAs at different levels to support RE at different levels. For example, a junior BA cannot do to the same degree what a senior BA can do. Senior BAs focus more on the strategic dimension of the business system rather than the operational dimension, which junior BAs generally focus on. Thus, practitioners can use these findings to help decide who they should acquire for their projects. Further, doing so should help them more effectively manage their resources. Our results provide vital information that can help organizations to further analyze and evaluate the skill sets of their BAs in order to decide who and how many BAs they need in each competency category (depending on the projects the BAs will work on) to achieve the desired performance during the business analysis. For instance, matching BAs' competency levels to the types of requirements they typically elicit could result in an organization's optimally using its resources and tools, which may decrease IS requirements-related rework and the risks and ambiguities that can negatively impact a project's overall performance.

Organizations can also extend our results to inform effective professional training and development plans for their BAs. For instance, they could develop and deploy a skill framework that provides guidance on how a junior BA can progress to an intermediate level. Understanding the skill sets and training of BAs can lead to the availability of better resources.

Our results also suggest that one could develop a practical skills framework for classifying BAs based on their competency level (i.e., senior, intermediate, and junior). A practical research-based framework would help one not only classify BAs but also their performance indicators. Business analysis body of knowledge (BABOK) could integrate our findings to inform decisions about senior, intermediate, and junior BAs by clustering the artifacts to add to the standards foundation to advanced levels.

6.3 Reflections and Limitations

Similar to any other research, one needs to review our results in light of their limitations. In this section, we discuss some of the key reflections and limitations of this research.

1. We presented the business scenario and viewpoints to the participants individually in the form of textual handouts. We did not use other means such as video technology to present the business scenario and viewpoints during the study.

2. We used a textual approach to explain the study's context to the BAs. Using modellng techniques to explain scenarios is another potential approach to explain a study's context. However, we did not use the modeling approach so we could constrain the study to the dedicated two hours and to standardize the approach for context awareness. The textual approach is a standardized approach that most everyone can understand, whereas not everyone can understand any single modeling technique.
3. For this study, we gathered BAs in a room where they collected requirements from the viewpoints we provided. In contrast, we could have used an online approach for the BAs to participate in the study, which could have attracted more BAs for this study. We did not use this approach because of the risks that could have jeopardized the study, such as network connection failure and the time delays involved in the online approach.
4. Customers are important stakeholders of a business organization. Their input can be useful for an organization to analyze and develop new systems. While we could have adopted a crowdsourcing approach to collect customers' opinions via social networking websites, our study used a fictitious scenario, which prevented our doing so.
5. We adopted a controlled experiment approach; however, we could have used ethnography research practices to observe the BAs' behavior as they selected requirements. However, doing so would be a time-consuming and expensive process. Also, the BAs may not have been comfortable with being observed, so we decided against this option.
6. The participants of this study came only from Australia and not other parts of the world. Participants from various countries or regions in the world could have different cognitive processes (based on their social and cultural backgrounds) when selecting stakeholders and collecting requirements, which may affect how a researcher develops themes based on them and their association with the BAs' competency. Therefore, examining whether participants around the world have different affects than local ones constitutes an important research area that research needs to investigate further.
7. We determined the BAs' competency level based on their years of experience in the industry; we did not include their qualifications, gender, or age as part of our investigation. Although we used a standard industry approach (years of experience), other qualifications could have provided insights into the factors that influence their performance. As such, future research could include such aspects and possibly develop more comprehensive and information relationships between BAs' competency and RE.
8. The research results are based on a specific scenario and may not be generalizable. Similar to other studies in different contexts (e.g., Gill, Bunker, & Seltsikas, 2015), our results provide deeper but previously unavailable insights that warrant further studies in this area.

6.4 Further Research

Businesses are increasingly becoming global, and businesses in one industry are creating alliances and partnerships with businesses in others. Thus, now we must ask whether the existing thematic analysis framework or approaches can deal with the rapid expansion of business organizations. The existing thematic analysis approach seems appropriate to capture global themes at an organizational or industry level. Do we need another level of theme (beyond global; i.e., super global) to deal with inter-industry level business organizations with requirements such as compliance and regulatory for all industries set by government bodies? Similarly, global level rules and regulations, such as environmental and ethical rules, could apply to all or most industries and agencies in the world. These two levels are above the current global level format of the existing thematic network analysis, which future research could investigate to enhance the thematic network analysis approach in general. In a nutshell, if required, researchers may use and extend the thematic-network approach and model to design and execute further empirical research that investigates various other perspectives of the relationship between BAs' competency and RE.

7 Conclusion

Researchers and practitioners have long recognized requirements elicitation as a challenge for organizations. Most researchers and practitioners have investigated this challenge from the perspective of the tools and techniques used for RE; however, they have focused little on the competency of the

professionals involved in using these tools and techniques for RE. RE is not so much about the tools, techniques, and processes but rather the people who actually perform RE (Gill & Bunker, 2013). Therefore, we conducted an exploratory study in a controlled environment by using the thematic network analysis and investigated the relationship between BAs' competency and RE.

The results of this study provide a number of insights and contributions to the theory of thematic network analysis used to identify relationships between the BAs' competency and RE. We present the relationships between the BAs' competency and requirements themes in the thematic network model. The thematic network constitutes this study's main contribution, and analyzing it highlights the fact that junior and intermediate BAs perform RE as competently as senior BAs but that senior BAs focus more on a business system's high-level requirements (strategic business goals) than low-level requirements (functional and non-functional) compared to junior and intermediate BAs. Organizations can use the resulting thematic network to make informed decisions about identifying and allocating the right resources (particularly the BAs) for the right job during IS projects. Thus, we suggest that a team of BAs with varying experience can produce diverse results because they seem to use different techniques. For example, they may produce requirements artifacts at different levels of detail (high to low level). Senior BAs in a team would apply a different approach to produce high-level strategic requirements compared to the intermediate and junior BAs. Further, two different teams of BAs with varying experience may not perform the RE activity following the same approach. Thus, a RE approach in a team and across teams of BAs could mix different techniques and produce different results.

We also found that thematic network analysis is a useful approach for studying the relationship between BAs' competency and RE and, thus, that thematic network analysis is not a standalone activity. Based on our findings, we discovered six key principles and a process that others should consider when conducting a thematic network analysis, particularly in the RE context. Future research could further investigate this valuable contribution to enhance and develop situation-specific thematic network analysis methods and theories. Our overall results are insightful for organizations and professional bodies in relation to managing and training BAs. Organizations need to realize that they need to clearly identify and define a BA's role to effectively elicit requirements from a business system's targeted stakeholders. This important IS area warrants further research given that we observed that thematic network analysis may need to go beyond global themes to deal with the requirements of business systems that now spread across industries and the world.

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Appendix A: A Modified Business Scenario

A "Five Star" multinational company is using IT to dramatically change many aspects of the way retailing is done. Five Star focuses on four aspects: pricing and merchandising, reducing operating cost, using information technology and strategic site selection. Through this strategy, Five Star is keen to achieve double digit profitability target and shareholder value. After 17 years of sustained growth in sales and profit, Five Star shows no intention of slowing its expansion. Since its creation the company has achieved one of the highest returns on equity in the industry. Since 2007, sales for Five Star have been exceeding those of its parent company and wants rapid increase in sale.

Business performance target of Five Star is to achieve total sales in Australia in excess of the sales of all Australian retail stores which aligned with Five Star's mission. For that, Five Star wants to pursue top quality control beyond conventional standards through which Five Star would be responding to customers' diverse needs by supplying items worthy of customer expectations. Five Star is keen to dominant the market through distribution and logistics efficiency, operation and information systems effectiveness, franchise support efficiency and corporate image. For effective customer service and better inventory control Five Star wants from their suppliers to deliver the products that were in demand on a just-in-time basis, thereby eliminating dead and slow selling items and replacing them by the faster selling one. It also includes high quality products and service to the customers with competitive price.

Cost reduction strategy is to find the best way for each store to control inventory. In particular, attention has been given to avoid non-availability—that is, losing a sale because something is out of stock. The company needs to not simply identify what particular products customers like but more importantly the company should accurately determine when, where and in which quantities and at which price these products are needed. Product ordering is the most constructive part of retail business. To address the rapid changes in the compositions of customer demands and long queues Five Star wants an efficient ordering system which can also help to solve excess inventory problems. In a retail shop the items kept in stock and on the shelf are precisely selected for the targeted customers and the products quality is kept high. Stores hold that right amount of stock for those selling items. To provide value-added services Five Star started a home delivery parcel service as well in cooperation with large transportation company.

Appendix B: A Sample of Four Viewpoints

Marketing Manager's Viewpoint

Since the customer demands for more variety, are changing rapidly in retail industry, for quick and effective response Five Star needs to constantly monitor customer needs and desires. In this regard the company collects customer profile data (age group and gender) on a continuous basis at the counter of their stores. The company needs to not simply identify what particular products customers like but more importantly we should accurately determine when, where and in which quantities and at which price these products are needed. Therefore, company believes that reviewing the data on continuous basis can help to deliver the products and services on-time as well as to forecast customers demand weeks ahead in a larger context through analysis and estimation. Five Star targets all the individuals living or working in the vicinity of the store. A new store will open only if there is enough population density within the area and no direct competition. The primary segmentation is, therefore, by geography. Then the customers can be classified into according to three shopping habits:

- Immediate consumption. These are mainly young people often single who want to buy typical items for instant consumption.
- Daily and distress. There are customers who make distress purchase or buy daily supplies.
- One-stop shopping. These are the customers who typically like to all their shopping in their neighborhood store.

Chief Information Officer's (CIO) Viewpoint

A "Five Star" multinational company is using IT to dramatically change many aspects of the way retailing is done. In surveys customers have typically complaint about: 1) the products they were looking for being sold, 2) the long waiting lines at the cashiers, the store being closed when they needed the service and product freshness. In new strategy, Five Star focuses on four aspects: pricing and merchandising, reducing operating cost, using information technology and strategic site selection. Through this strategy Five Star is keen to achieve double digit profitability target and shareholder value.

Store Manager's Viewpoint

Serving as safe and secure community base Five Star work to prevent underage sale of liquor and cigarettes by clearly labeling sales areas and checking customer's age at the counter. It is Five Star duty as a member of local community to care for the environment and contribute to a sound upbringing of young customers. In addition, to providing products and services Five Star stores are open 24 hours a day, 365 days a year making them ideal as bases able to serve the general public in case of emergency by supporting such service as responding to children calls.

End User's Viewpoint

In a retail shop the items kept in stock and on the shelf are precisely selected for the targeted customers and the product quality is kept high. Five Star discovered that customer loyalty was driven more by specific items than by item categories. The implication was that the Five Star needed to plan demands and deliver on an item-by-item basis. Stores hold that right amount of stock for those selling items. Since the product turnover is high the goods to be always new and fresh. To address the rapid changes in the compositions of customer demands and long queues Five Star wants an efficient ordering system which can also help to solve excess inventory problems. To provide value-added services Five Star started a home delivery parcel service as well in cooperation with large transportation company.

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